

REMARKS

Reconsideration of the present application is respectfully requested.

I. Claim Status

Claims 19-21, 24 and 28 have been amended to delete reference numerals. Claim 19 also has been amended to recite that “the first porous material has a pore size that is smaller than the pore size of the second porous material.” Support for this amendment can be found in the specification on page 8, lines 16-22. Claims 22, 23, 25-27 and 29-34 have been withdrawn. New claims 35-43 have been added. Support for the new claims is found in the specification as follows: claim 35, page 8, lines 27-28; claim 36, page 8, lines 12-13; claim 37, page 8, line 23 and page 13, lines 11-13; claim 38, page 13, lines 12-13; claim 39, page 11, lines 17-18; claim 40, page 11, lines 17-20; claim 41, page 11, lines 22-23; claim 42, page 11, lines 22-26; and claim 43, page 13, lines 17-18.

Thus, claims 19-21, 24, 28 and 35-43 are currently pending. No new matter is added by way of this amendment.

II. Rejection under 35 U.S.C. § 102(e)

Claims 19 and 24 are rejected as anticipated by published U.S. Patent Application 2002/0000066 A1 to Bentley et al. (“Bentley”).

With regard to claims 19 and 24, the Examiner contends that Bentley teaches an apparatus having all the elements claimed therein.

Bentley is *silent* with regard to the relative size of the pores in the “boundaries of the zones [that] are made permeable to the flow of a reaction stream”, merely noting that “[t]he openings can also be sized and spaced so as to ‘partition’ and regulate flow from one zone to the next” (Bentley [0019], *see* [0026]).

Independent claim 19 has been amended to recite that “the first porous material has a pore size that is smaller than the pore size of the second porous material” and, thus, recites features not taught or suggested by Bentley. To anticipate an invention under § 102, a reference must teach each and every aspect of the claimed invention (MPEP § 2131; *see Bristol-Myers Squibb Co. v. Ben Venue Labs.*, 246 F.3d 1368, 1374 (Fed. Cir. 2001) (“A claim is anticipated if each and every limitation is found either expressly or inherently in a single prior art reference.”)). Accordingly, Bentley does not anticipate the invention defined by claim 19.

Claim 24 depends from claim 19 and incorporates all the limitations thereof. Accordingly, claim 24 is not anticipated for at least those reasons specified in relation to claim 19 above. Withdrawal of the rejection of claims 19 and 24 under 35 U.S.C. § 102 is respectfully requested.

III. Rejection under 35 U.S.C. § 103

Claims 20-21 and 28 are rejected as obvious over Bentley, as applied to claim 19, in view of published U.S. Patent Application 2002/0042035 to Komiya et al. (“Komiya”) and in further view of U.S. Patent 5,890,886 to Döker et al. (“Döker”). The Examiner concedes that Bentley “fails to show specific Péclet values in relation to flame propagation” and “does not teach a burner to effect a flame” but contends that these features are accounted for in the Komiya and Döker references (office action, dated June 28, 2006, pages 3-4, overlapping paragraph).

With respect to claim 20, the Examiner contends that it would have been obvious to include the burner taught by Komiya in the invention of Bentley *to heat* the interior of the reformer. However, the Examiner concedes that Bentley, when modified to include a burner, still “fails to show wherein the first porous material has a pore size that has a Péclet number that is less than a critical Péclet number below which flame propagation cannot occur” (*Id.*, page 4, second full paragraph). Accordingly, the Examiner relies on Döker’s alleged teaching of “a burner having a porous body with a Péclet number smaller than 65 in order to provide a flame barrier” to account for this missing feature (*Id.*). The Examiner contends that it would have been obvious to one having ordinary skill in the art at the time of the invention to include a burner having a porous body with a Péclet number smaller than 65, as taught by Döker, in order to function as a flame barrier in Bentley’s modified apparatus.

With respect to claims 21 and 28, the Examiner notes that Bentley does not explicitly teach that the first porous material/inside second reforming zone (20) has fine holes, but contends that it is inherent that a reforming zone would contain catalyst material which is porous by nature (*Id.*, page 4, last full paragraph).

This rejection is respectfully traversed. The cited references, taken alone or in combination, fail to teach or suggest the all the features of the presently claimed apparatus. Specifically, the references do not teach or suggest, alone or in any combination, an apparatus

comprising two porous materials “wherein the first porous material has a pore size that is smaller than the pore size of the second porous material” as called for in the present claims.

Further, applicants respectfully submit that one of ordinary skill in the art would not have been motivated to combine the teachings of the cited references to arrive at the claimed “apparatus to produce hydrogen by means of the oxidation of fuels” as neither Komiya or Döker teach or suggest the partial oxidation of fuels to obtain hydrogen (*see* specification page 1, lines 9-16; page 6, lines 1-2). To this end, the burner taught by Komiya is important only *to heat* the reactor and it is not used for a partial oxidation (Komiya [0085]). Meanwhile, Döker discloses a burner that is employed for heating systems and, thus, is designed for the a *complete* combustion of the fuel. Accordingly, a person of ordinary skill in the art at the time of the invention would not have relied upon the burner of either Komiya or Döker to improve a method or burner to produce hydrogen via *partial* oxidation using the claimed apparatus.

Bentley, in fact, *teaches away* from the claimed invention. Bentley does not suggest directing the reaction stream flow path from “small-diameter pores to larger diameter pores.” To the contrary, one of ordinary skill in the art would understand Bentley to have the opposite teaching (*see* specification, page 8, line 17). Bentley has as its objective decreasing the pressure requirements of the reaction stream flow path that occurs in reactors using “tortuous flow paths” such as axial flow paths, helical zones, or transfers of the reaction stream “through some form of constricting geometry” (Bentley [0008], *see* [0016]). Bentley achieves “lower pressure . . . for flowing the reaction stream” by introducing a greater surface area through which flow might occur and by configuring the flow path to permit flow in diverging radial directions away from the first zone and into and through subsequent zones (Bentley [0015]-[0019]).

While Bentley teaches the use of permeable partitions, or boundaries, between zones, these are used merely to produce sufficient “back-pressure” to make the reaction flow between zones more uniform (Bentley, *see* [0040] and [0019]). This “back-pressure” must be low enough “so as not to impair flow efficiency” (Bentley [0040]). Accordingly, one of ordinary skill in the art would have understood at the time of the invention that, in Bentley, pressure is lost as the

reaction stream flow path passes through each successive zone radially outward from the central chamber. Thus, the size of the pores of any permeable partitions successively involved in the reaction flow path must, if anything, become smaller--not larger--in order to effectively create sufficient "back pressure" at lower pressures to maintain flow efficiency.

In view of the above remarks, applicants respectfully submit that Bentley, Komiya and Döcker, when considered alone or in any combination, do not suggest the subsisting claims. Withdrawal of this rejection and passage of the claims to allowance is believed to be in order.

CONCLUSION

In view of the above amendment and arguments, applicants believe the pending application is in condition for allowance and such action is earnestly solicited. If there are any other issues remaining which the Examiner believes could be resolved through either a Supplemental Response or an Examiner's Amendment, the Examiner is respectfully requested to contact the undersigned at the telephone number indicated below.

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Respectfully submitted,

By 

S. Peter Ludwig

Registration No.: 25,351

DARBY & DARBY P.C.

P.O. Box 5257

New York, New York 10150-5257

(212) 527-7700

(212) 527-7701 (Fax)

Attorneys/Agents For Applicants